

Cold-water coral research in the UK

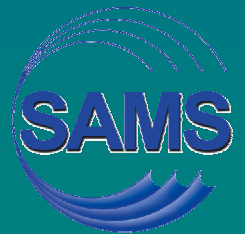
- current activity and future collaborations

J Murray Roberts
Scottish Association for Marine Science

Deep-Sea Corals Collaborative Planning Meeting

Tampa, Florida

14 November 2002



Why ?

- What controls growth and development?
- How do cold-water corals reproduce & disperse?
- Significance of 'biodiversity hot-spots'?
- Climate change: Can cold-water corals help us to reconstruct past circulation regimes?
- Biotechnological potential?



Background in UK

- Late 19th century voyage of the Porcupine, publications by Duncan. Other early work, Wyville-Thomson, Fleming (1846), Gosse (1860).
- 1970s studies Wilson (JMBA, 1979a,b). Focus on coral distribution.
- Interdisciplinary studies:
 - 1997 'MIME' projects, UK oil/gas
 - 2000 'ACES' project, EU 5th Framework
- Focus on ecosystem function driven by environmental sensitivity concerns.



Where?

- British Antarctic Survey (Rogers)
- Royal Holloway University of London (Wilson)
- SAMS, Dunstaffnage Marine Laboratory (Gage, Gass, Roberts)
- Southampton Oceanography Centre (Billett, Bett, Tyler)
- University of Glasgow (Hall-Spencer)
- University of Liverpool (Wolff)



What? & How?

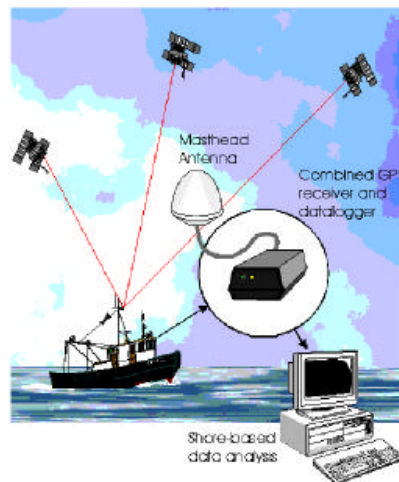
- Wide area surveys driven by development of Atlantic Frontier (AMES 96 & 98). Darwin Mounds
- SEA surveys funded by UK Govt.
- Development of deep-water ROV 'ISIS' (Tyler, SOC).
- Benthic lander development and test facilities (AutoMERS, Aberdeen University & SAMS).
- Northern Seas Research programme (SAMS & NERC) 2001-2006.
- Individual fellowship programmes (Hall-Spencer)



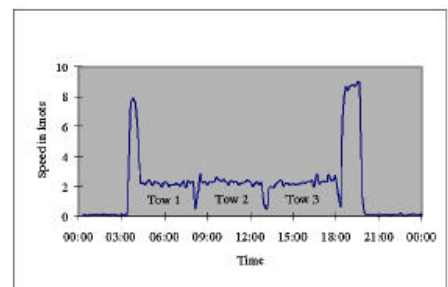
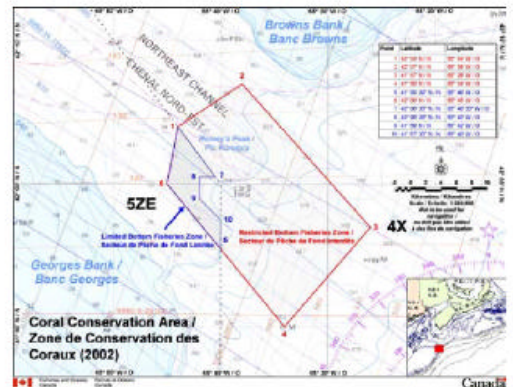
SATELLITE TRACKING A TOOL TO PROTECT DEEP-WATER CORALS

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Norway and Canada have recently designating deep-water coral protected areas. Our work on fishing impacts (1) and vessel tracking (2) shows that satellite monitoring could provide a relatively inexpensive but powerful tool in reducing the impact of towed gear on offshore coral habitat. All EU vessels >24 m in length are fitted with this technology.

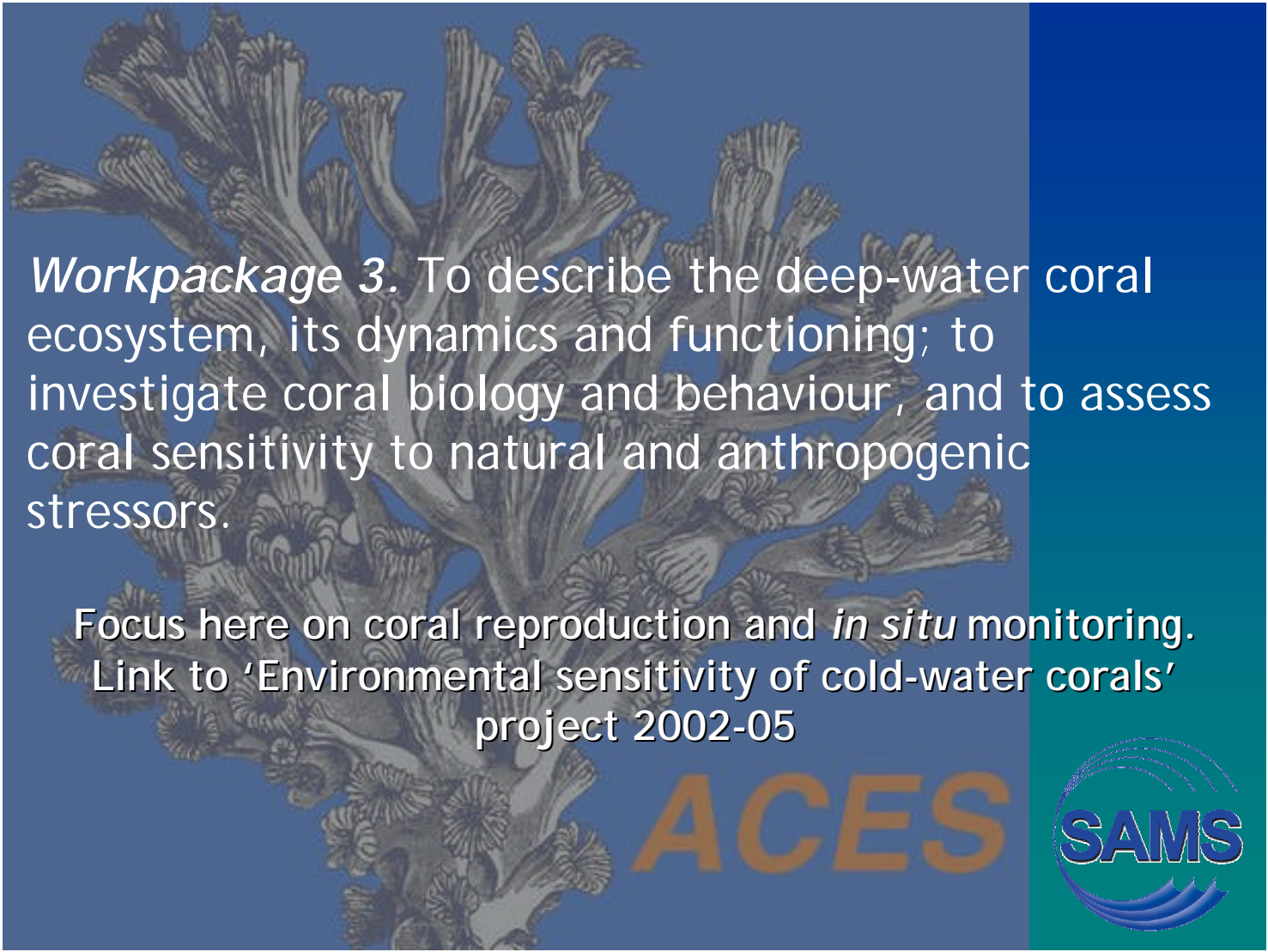


The system used experimentally off Scotland provided accurate position, time and fishing activity information for the inshore fleet.



References

- Hall-Spencer, J.M., Allain, V. & Fossa, J. H. (2002) Trawling damage to Northeast Atlantic ancient coral reefs. *Proceedings of the Royal Society of London* **269**, 507-511.
- Marrs, S. & Hall-Spencer, J.M. (2002) UK coral reefs. *The Ecologist* **32**(4), 36-37.



Workpackage 3. To describe the deep-water coral ecosystem, its dynamics and functioning; to investigate coral biology and behaviour, and to assess coral sensitivity to natural and anthropogenic stressors.

Focus here on coral reproduction and *in situ* monitoring.
Link to 'Environmental sensitivity of cold-water corals'
project 2002-05

ACES



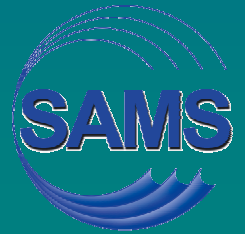
Reproduction of cold-water corals *Lophelia pertusa*, *Madrepora oculata*

- Paul Tyler & Rhian Waller (SOC)
- Few of the samples examined were reproductive
- Seem to have low fecundity
- Initial interpretation suggests that damaged reefs will be slow to recover by sexual reproduction.



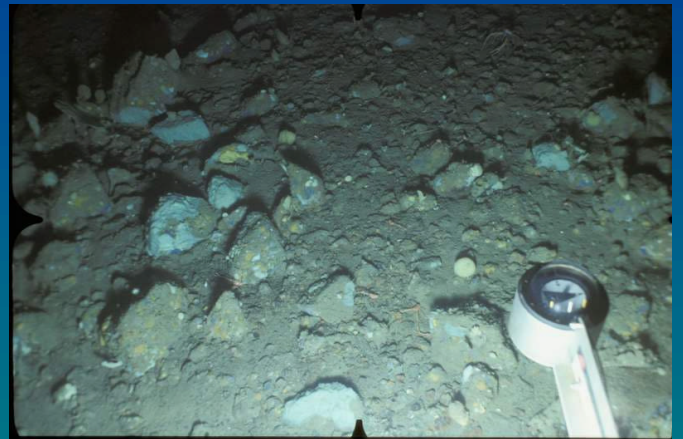
Section of *Lophelia*
mesentery containing an egg

- Molecular genetics, initially using ITS-1, now developed to use microsatellite sequencing (Le Goff-Vitry, Rogers).

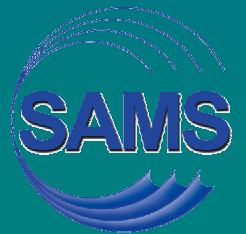


In situ monitoring. Lander design considerations

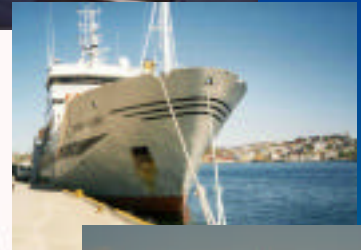
- Robust, corrosion-resistant and adaptable platform.
- Flexible deployment options.
- Stable in high currents.
- Depth rating to at least 1200m.



*** Ballast release ***

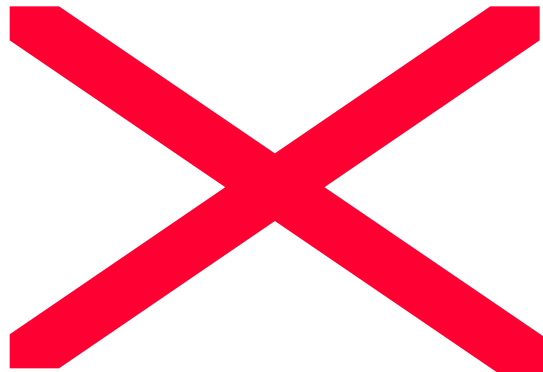


SAMS-Photo Lander



64° 05.00 N
08° 02.21 E

280m depth



Sula Ridge deployments.

9-13 July 2001, RV Johan Hjort. 4 days

18 June - 8 July 2002, RRS James Clark Ross. 21 days

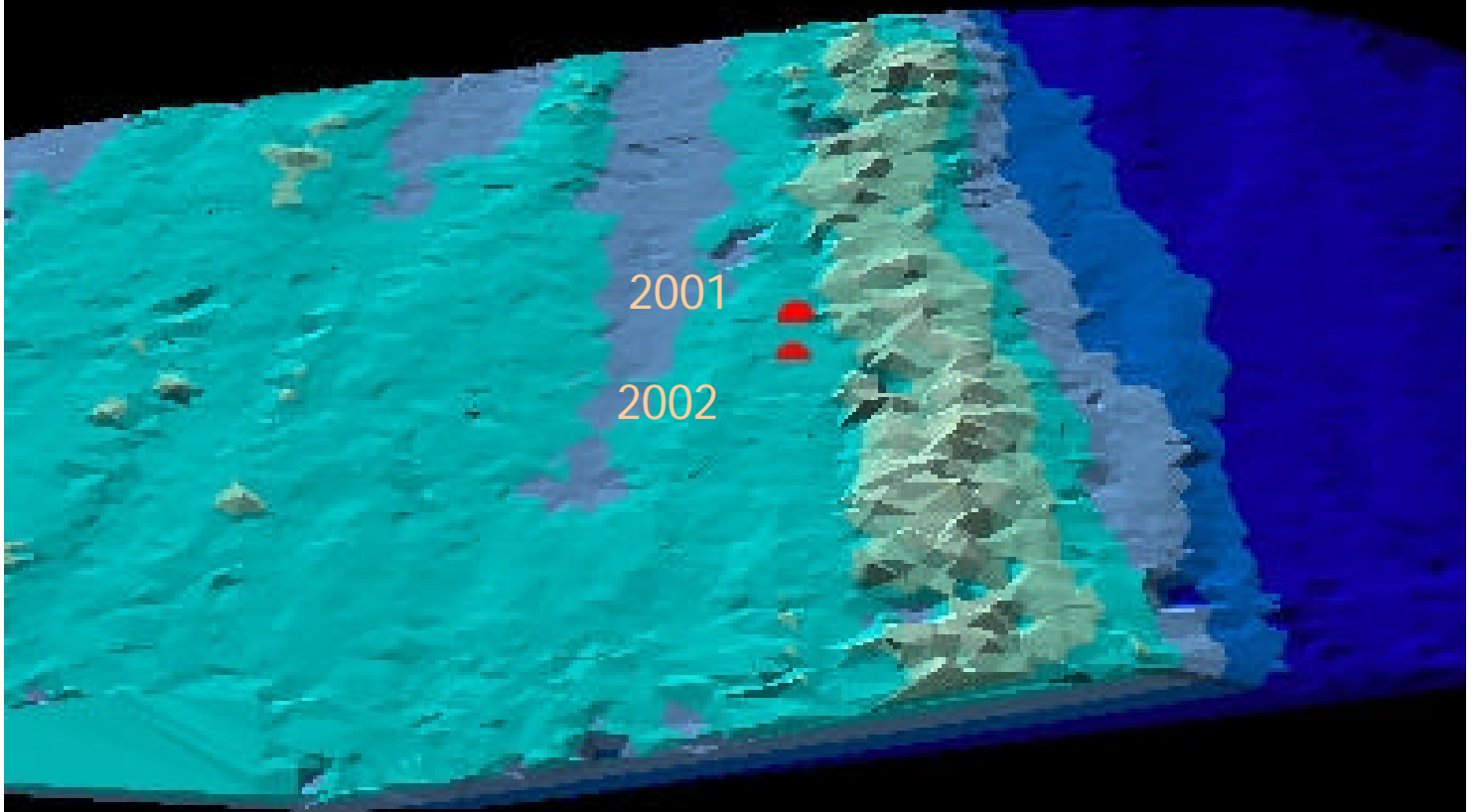


RRS James Clark Ross 75
EM120 Multibeam survey
SAMS Photo lander deployment sites

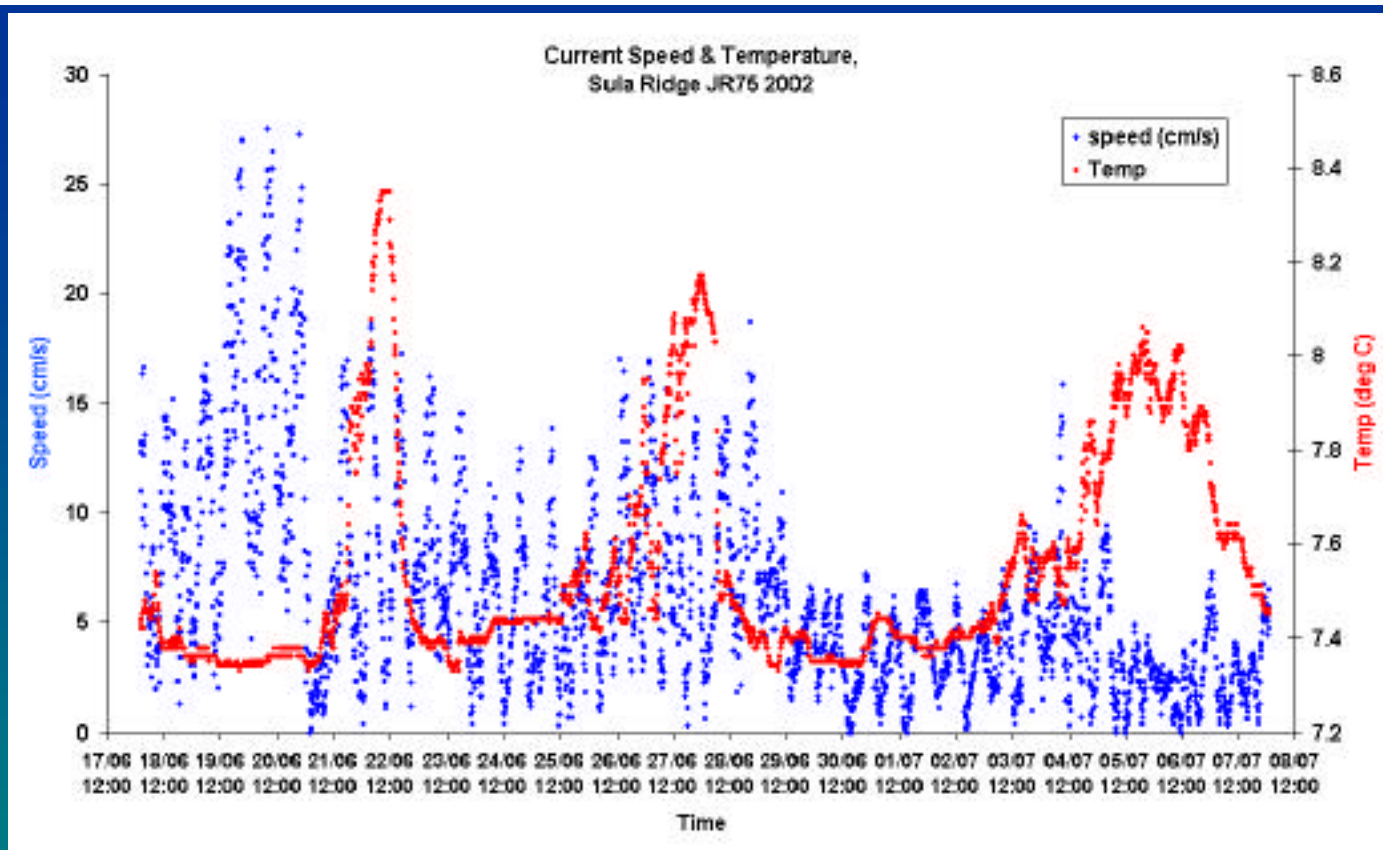
2001

2002

(Steve Gontarek & John Howe)





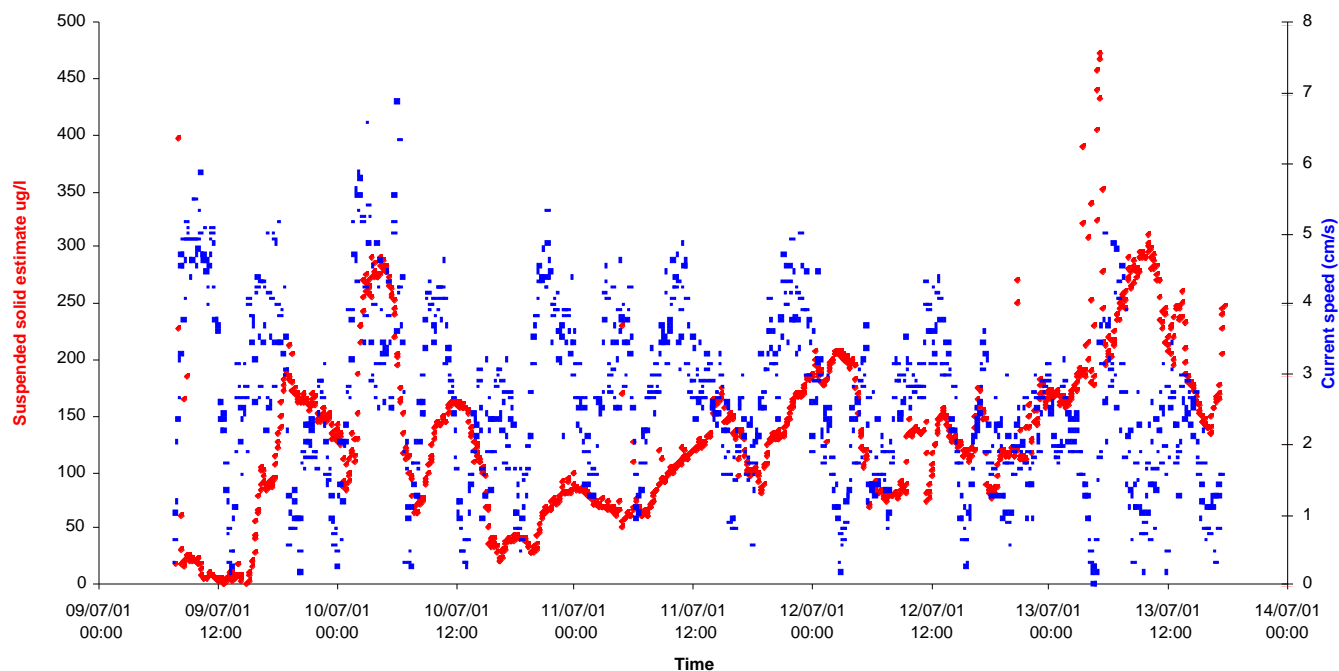


Temperature
Max 8.35 °C
Min 7.33 °C
Mean 7.55 °C

Current speed
Max 27.5 cm/s
Min 0 cm/s



Estimated suspended sediment concentration and near bed current speed by Sula Ridge
(SAMS-Photo Lander 2001)



Estimated currents at 0.5m above bed:

Max 6.9 cm/s

Min 0.16 cm/s

Mean 2.61 cm/s

Estimated sediment

resuspension at 0.5m above bed:

Max 771 $\mu\text{g/l}$

Mean 136 $\mu\text{g/l}$





Beryl Alpha
Flare support tower

72 m water depth



Mobil North Sea Ltd.

‘Environmental sensitivity of cold-water corals’

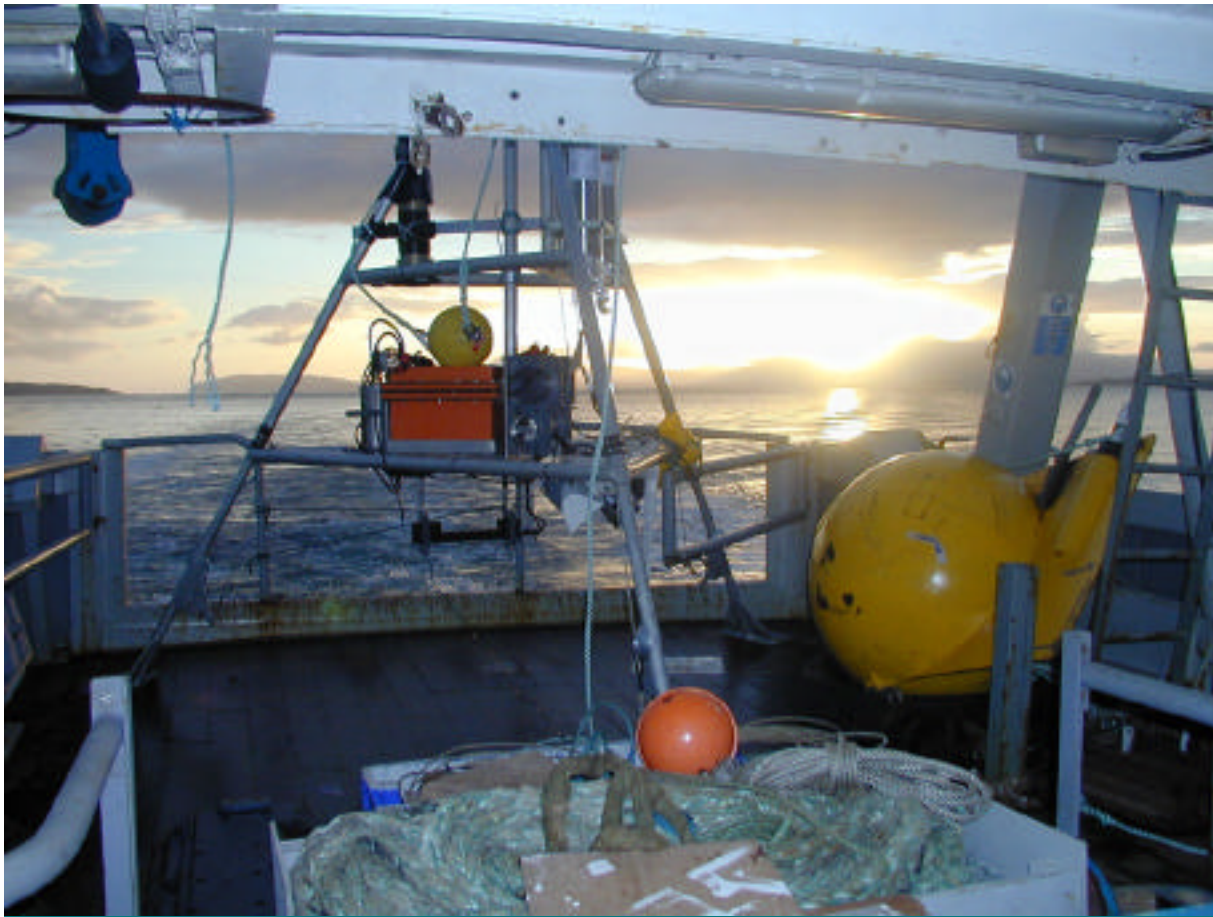
- Mapping distribution
- Skeletal record analysis
- Live coral study linked to *in situ* monitoring.
- 2002-2005



Current & Future Projects

- ACES project (2000-03)
- ECOMOUND & GEOMOUND projects
- Environmental sensitivity of cold-water corals (Gass, Roberts, SAMS & AFEN).
- EU margin projects under the 6th Framework (Freiwald, Dullo et al.).
- Inshore coral habitat mapping (SAMS et al.).
- Seafloor observatories.
- *In situ* monitoring gorgonian forests in Gulf of Maine (Watling, Roberts).
- ICES study group on (Tasker, JNCC).





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